

# MIDWEST TRANSPORTATION CONSORTIUM



## ANNUAL PROGRESS REPORT October 2002

*Submitted to:*

Office of Innovation, Research & Education (DIR-1)  
U.S. Department of Transportation  
400 7<sup>th</sup> Street, Room 8417  
Washington, D.C. 20590-0001

*Submitted by:*

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## **From the Director**

For the past three years, the Midwest Transportation Consortium (MTC) has focused its efforts in supporting the development and use of asset management systems in transportation. The MTC's main focus is on human capital development—promoting educational and work experience programs that will help train the next generation of leaders for the transportation industry, particularly in our four-state region. Asset management concepts have been incorporated into a number of courses at the six MTC consortium member schools. For example, the Spring Transportation Seminar offered within the region via Internet-based videoconferencing technology has been focused on asset management topics for the past several years. A related focus on transportation security (unfortunately needed after September 11, 2001) was also implemented this past year. More than 30 graduate students in five diverse academic disciplines (including civil and construction engineering, urban planning, transportation logistics, and geography) now complete their academic programs with an excellent understanding of the state of the practice of transportation asset management. They will become new leaders in transportation, whether in government, consulting, or academia.

The MTC's research program is ending its third year of operation and recently issued its fourth request for research proposals in Fall 2002. Final reports from the first three years of operation of the program are now being reviewed, published, and disseminated. Over two hundred thousand dollars in new research projects are expected to be approved during the first half of 2003. The MTC's long-term research goal is to build a portfolio of projects involving several million dollars in Federal University Transportation Center (UTC) and matching funding that will make it easier for government agencies and companies to implement transportation asset management systems. The MTC's research focus has been on asset management tools and techniques. One special area of emphasis at Iowa State University is the use of remote sensing and other spatial data for asset management. This effort effectively leverages Iowa State University's roles as both a University Transportation Center and as a member of the National Consortium on Remote Sensing (NCRS) in Transportation Infrastructure. The latter consortium is an effort to commercialize remote sensing technological development from the space program and defense activities.

The MTC also plays a role in terms of outreach and technology transfer activities related to asset management and Government Accounting Standards Board Statement 34 (GASB 34) in our region. During 2002, the MTC sponsored or co-sponsored several workshops related to asset management and GASB 34. One example workshop held in Kansas City at the end of the MTC's most recent fiscal year provided most of the regional planning commissions in Iowa and Missouri with an overview of asset management concepts and the requirements associated with GASB 34. This workshop was intended to allow the regional planning commissions to begin to assist their clients (small cities and rural counties) with asset management-related issues.

As transportation asset management moves into "production mode", the Midwest Transportation Consortium strives to be of assistance at both a regional and national level. The MTC is currently involved in efforts by the American Association of State Highway and Transportation Officials (AASHTO) to create an Asset Management Institute and with planning for the next National Transportation Asset Management Workshop.

## A. Year Three Annual Report

### Consortium Theme

The Midwest Transportation Consortium (MTC) is the University Transportation Center Program for Federal Region 7, which includes Iowa, Kansas, Missouri, and Nebraska. Iowa State University, through its Center for Transportation Research and Education (CTRE), is the MTC's lead institution. ISU is partnering with the University of Missouri-Columbia through UMC's Transportation Infrastructure Center (TIC).

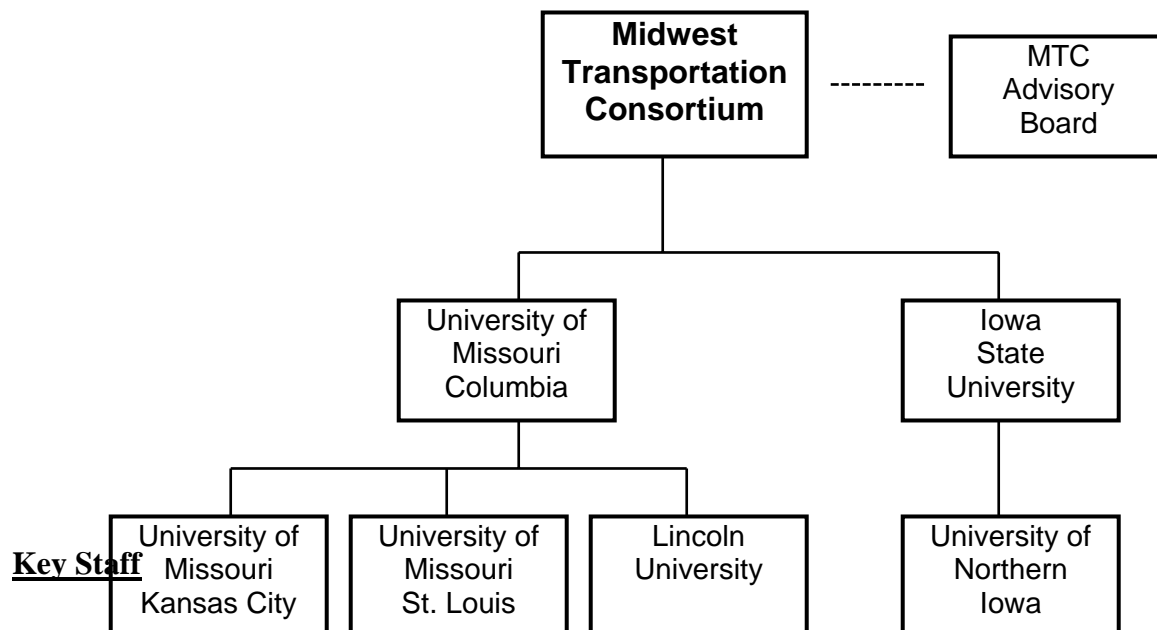
Four junior partner institutions are also programmatically linked to the MTC. These are the:

- University of Northern Iowa in Cedar Falls, Iowa
- University of Missouri-Kansas City
- University of Missouri-St. Louis
- Lincoln University in Jefferson, Missouri, an Historically Black University (HBU)

The theme of the MTC is *Sustainable Transportation Asset Management Principles and Techniques*. This theme is in concert with the US DOT's strategic goals and is of significant importance to transportation professionals in the next century. The MTC is committed to building transportation research and education programs at the junior partner universities and to assuring region-wide participation in its research and technology transfer activities.

### Center Organization Chart

The MTC is organized to some extent by geography. The Center Director and associated staff at Iowa State University handles most administrative duties and handles meetings and correspondence with the MTC Advisory Board and research grant principal investigators. The Center Associate Director coordinates all activities of partner institutions in the state of Missouri. An organizational chart is shown below.



*(Consortium Director, Associate Director and Educational Coordinators at each partner institutions)*

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## **Center Goals**

Within the theme area of transportation asset management, the MTC has established a number of major goals. These are to build expertise, develop a national reputation, to increase the number and diversity of professionals, and to become a regional and national resource. Specific MTC goals are:

### **Education**

- Establish Transportation Scholars Programs at all member institutions, based on a successful program at ISU and UMC and working especially closely with Lincoln University. Have 40 students participate annually in multidisciplinary curriculum, "learning community" activities, research assistantships, seminars, and two conferences. Roughly half of these students will be at the lead university and the other half at the other five partner institutions.
- Establish Virtual Transportation University to organize and promote synchronous (real-time) and asynchronous (non real-time) distance learning programs for all of Region 7.
- Increase diversity by working closely with Lincoln University and by partnering with university offices of minority student affairs.

### **Research**

- Develop a body of research in the theme area performed by researchers at all universities in Region 7 in a variety of disciplines.
- Assure region-wide, quality research through a solicitation for research prospectuses from all universities in Region 7 and a two-tiered, unbiased peer review of prospectuses.
- Coordinate research with Region 7 universities and with other UTC's, particularly those with similar themes. Coordination with the UTC located at the University of Wisconsin at Madison has been especially close and fruitful.

### **Technology Transfer and Outreach (T<sup>2</sup>)**

- Provide project-level reports, manuals, software, and other research projects.
- Provide program-level, regional/national workshops, conferences, and seminars.
- Establish regional Virtual Transportation Community to provide online research briefs, threaded electronic forums, etc., to serve all universities in Region 7. (This goal is encompassed in the TREXPO web site discussed later in this report.)

## **Major Accomplishments During Year Three**

The MTC continues to achieve successes in both education and outreach/technology transfer. In the area of education, the MTC has augmented the ability of existing transportation programs at Iowa State University and the University of Missouri-Columbia to develop high-quality students who will become high quality transportation professionals. The MTC is allowing the University of Northern Iowa, Lincoln University and the other MTC consortium partners to develop new transportation programs from the ground up. Northern Iowa was able in Years One through three to offer transportation courses for its students. Lincoln University began to offer new programming related to asset management during Year Two of the MTC grant. It has developed a new coop program in partnership with the University of Missouri-Columbia and the Missouri Department of Transportation.

Several important outreach activities related to Asset Management initiated during years one and two were extended and expanded during year three. These include several workshops that have already been held or will be held in the region and specialized World Wide Web (WWW) content. The MTC has become a significant player in discussions of Asset Management and the implementation of provisions of Government Accounting Standards Board Statement 34 (GASB 34) in the region and is beginning to become recognized for its expertise in the field at the national level in such organizations as AASHTO and the Transportation Research Board (TRB).

The MTC's third major component, research, is producing final reports and other products such as software tools. An extensive portfolio of projects involving principal investigators at a number of universities in three of the four MTC states have been approved and are under contract. These projects are providing work and learning opportunities for students and build a critical mass of knowledge on asset management within Region 7. Additional research project competitions will occur in grant years four through five subject to availability of funding.

Success stories and information for each major programmatic component of the MTC are provided below. These are categorized by the MTC's main goals as described in its strategic plan:

- Education on and Human Capital Development
- Outreach and Technology Transfer
- Research Transportation Asset Management

## **Education and Human Capital Development Activities**

### **Expanding Educational Opportunities for Students**

Developing the human capital needed by transportation organizations located in and around Region 7 remains *the* major emphasis area for the MTC. As such, MTC continues to stress improving educational opportunities for its students including work opportunities on research projects, job placement efforts, and travel to national conferences. In terms of travel a large contingent of students from two MTC member universities was able to attend the annual meeting of the Transportation Research Board (TRB) in Washington, DC in January 2002. These Universities included Iowa State University and the University of Missouri-Columbia. As in previous years, over 20 students from MTC partner schools attended TRB in 2002. Several students were able to present posters or otherwise actively participate in TRB.



Plans are being made to once again have a large number of students from at least two of the MTC member schools (Iowa State and Missouri-Columbia) attend the TRB Annual Meeting in Washington, DC in January 2003. Iowa State is planning to send nearly 15 students and UM-C six, giving the MTC schools and their students tremendous exposure and learning opportunities. In addition, Iowa State will be making an effort to send a much larger contingent of faculty members to the TRB Annual Meeting than in previous years.

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### **Expanding Distance Learning Offerings in the Region: Spring Transportation Seminar**

Iowa State University has offered a Spring Seminar in Transportation (Transportation 691) for a number of years. The course, a 15 lecture series presented by outside speakers, is designed to bring together transportation students from a variety of disciplines and to introduce them to a variety of topics that they might not cover in other coursework. The aim of the seminar is to enrich and diversify the educational opportunities of students (and others) in the MTC region by presenting a variety of topics. Planning for the seminar gets more ambitious each year and more national level speakers are being attracted. As was the case last year, this course was offered simultaneously at multiple universities in the MTC's four-state region through the use of H.323 Internet-based videoconferencing technology. A special emphasis was placed on transportation security topics as a result of the events of September 11, 2001.

In Spring 2002, the following topics were covered by speakers:

- Information Security and the Transportation Industry
- Experiences of a First Responder at the World Trade Center
- Terrorism and the Built Environment
- The Business of General Aviation
- Aviation Security: Past, Present and Future
- The Air Charter Business
- Security Activities Related to Bridges
- Economics and Engineering: Asset Management Fundamentals
- Implementing Asset Management in a State DOT
- The Future of Energy in Transportation
- Transportation and Economic Development: Site Selection
- Homeland Security and Transportation After 9/11
- Managing a Modern Logistics Company Today
- Reinventing Highway Finance and Taxation

Speakers represented a number of organizations, including the Iowa Department of Information Technology, the University of Missouri, the American Concrete Paving Association, the Joplin Missouri Airport, the Des Moines International Airport, Livingston Aviation, the Texas and Michigan Departments of Transportation, the Federal Highway Administration, the Iowa Energy Center, the Cedar Valley

Economic Development Authority, the Iowa Department of Public Defense, Lanter Trucking, and the Public Policy Institute at the University of Iowa. Although there were many excellent presentations, the presentations by Jim LaFrenz of the American Concrete Paving Association regarding terrorism and the built environment and the presentation by Dr. David Forkenbrock of the University of Iowa regarding re-engineering highway finance and taxes drew the most positive response from students. The 2002 seminar led to the development of a strong relationship between Iowa State University and the Iowa Department of Public Safety, the lead homeland security agency for Iowa. This relationship has led to requests for technical assistance from ISU on a variety of issues, including developing evacuation plans for major public facilities.

For 2003, four universities (ISU, UM-Columbia, UM-St. Louis, and UNI) are again involved in planning the seminar and arranging for speakers. ISU and Missouri-Columbia are, as senior partners in the MTC, arranging for most of the speakers. The main focus area for 2002 is expected to be advanced information technology and software tools for transportation asset management. Another focus area will be railroad transportation.

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### **Expanding the Use of Videoconferencing Technologies in Region 7**

A videoconferencing classroom at CTRE/ISU is now being used on a regular basis to provide distance learning opportunities throughout Iowa, the MTC region, and even nationally.

An ultimate goal of the MTC is to share many more educational resources through videoconferencing technology in a "Virtual Transportation University".

The CTRE videoconferencing facility was financed through a combination of sources, including Iowa State University, the Iowa State University Research Park, and the Iowa DOT. The facility:

- Broadcasts via H.320 compressed videoconferencing protocol, the accepted standard for global videoconferencing. (Also will connect via H.323 Internet conferencing standards.)
- Broadcasts at up to 15 frames per second, generally giving the impression of full-motion video.
- Can be connected to:
  - ✓ The Iowa Communications Network (ICN) and Missouri Research and Education Network (MORENET) through networking bridges.
  - ✓ More than 745 facilities in Iowa alone, at least one in every county, including:

➤ 11 Hospitals	➤ 57 Iowa National Guard Armories
➤ 102 Community Colleges	➤ 47 State Agencies
➤ 31 Regents University Sites	➤ 17 Federal Agencies
➤ 20 Independent Colleges/Universities	➤ 11 Hospitals
➤ 16 Area Education Agencies	➤ 50 Public Libraries

- ✓ The Iowa Department of Transportation's video network.
- ✓ Sites around the world via private videoconferencing networks such as Sprint and AT&T.
- Accommodates up to 49 people, with movable tables for flexible teaching/meeting arrangements.
- Includes the following special-use technologies and equipment:
  - Two video cameras and three large monitors
  - Document camera and overhead projector
  - Input for IBM-compatible personal computer
  - Ethernet/local area network jack
  - Video special effects console to produce picture in picture effects
  - Room audio and microphone for stand-alone use
  - Audio conferencing (full-duplex speakerphone) and fax services
  - Large marker boards and projector screen
  - A video distribution amplifier that allows computer output to be seen on video monitors, over a videoconference, and on a large projection screen all at the same time
  - “Smart” whiteboard capabilities that allow for capture of writing on a marker board to electronic formats.

Since the CTRE/ISU’s videoconferencing equipment was installed in March of 2000, it has been used for a total of over 540 calls/sessions totaling almost 180 hours (about 11,000 minutes). The typical videoconferenced class or workshop session lasts two hours, but many other meetings and test sessions are much shorter. The MTC has used this system to conduct meetings for major research projects it is involved in with other universities around the country in order to save travel time and cost.

The room equipment is currently being upgraded to include wireless Ethernet and Internet access, laptop computers for instructional purposes, and a dedicated high-luminescence projector.

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### **MTC Annual Regional Student Paper Competition**

The MTC holds an annual student paper competition in the Fall of each year. The current paper competition was underway as of the preparation of this report and will be completed when an MTC Scholars Conference is held at Iowa State University on November 15, 2002. The competition received a record number of paper submissions this year, 13. Eight presentations will be given by students from two universities: Iowa State and Missouri-Columbia. One will be by an undergraduate student. Cash prizes will be given to the best graduate and undergraduate paper/presentation.

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### **The MTC Student of the Year For 2001-2002**

The MTC Student of the Year Competition is a competitive program run each year and is open to students at any MTC consortium school who participate in one of the schools' Transportation Scholars Programs. The Scholars Program provides partial financial support for graduate students (and a few, selected undergraduates) as well as seminar and conference travel opportunities. The selection of the student of the year is based upon multiple criteria including student's academic and research efforts plus their involvement in extracurricular activities related to transportation.

Vanessa Amado was named the Outstanding Student Of The Year – 2001/2002 for the Midwest Transportation Consortium. Ms. Amado was a PhD candidate in Civil Engineering at the University of Missouri-Columbia. Her area of research emphasis is pavement management databases and knowledge discovery systems and she was able to present a paper on that topic at the TRB annual meeting in 2002.

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### **Miscellaneous Awards Received**

Iowa State University, the lead institution in the MTC, was the recipient of several unique transportation-related awards during 2001-2002. These include:

Iowa State University's Transportation Student Association (TSA) received the best Institute of Transportation Engineers (ITE) student chapter award for our region for the third consecutive year. The TSA is a very active and innovative student organization and is directly involved in many of the MTC's activities, including organizing the annual trip to TRB and the new student recruitment effort.

Jamie Tunnell Luedtke, a graduate student in Transportation at Iowa State University was awarded one of the first fellowships given by AASHTO in honor of former Executive Director of AASHTO Frank Francois. AASHTO announced an annual competitive fellowship of \$10,000 to states showing the strongest record of transportation innovation. Mr. Francois served as Executive Director for 18 years and was a strong advocate for transportation education and research during his tenure. The purpose of the fellowship is to encourage transportation education leading to innovation in the field.. The fellowship is awarded to Luedtke was given to the Iowa Department of Transportation in honor of former Deputy Director of AASHTO, David J. Hensing. Mr. Hensing was a 1960 graduate of ISU in Civil Engineering and Mr. Francois is a 1956 graduate of ISU in Civil Engineering. AASHTO announced the inaugural Francois award in December 2000, specifying that the inaugural award go to Iowa State University in honor of Mr. Francois and Mr. Hensing. Ms. Luedtke was presented the award in October, 2002 at the AASHTO meeting in Anchorage, Alaska.

MTC Director David Plazak won the Iowa Chapter of the American Planning Association's (APA) Excellence in Planning Education Award for 2001, partly as the result of the new transportation policy planning course he developed.

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#### **Four New Asset Management-Related Courses Continue To Be Offered**

As a result of their membership in the Midwest Transportation Consortium, Iowa State University, Northern Iowa, Lincoln University and the University of Missouri-St. Louis have each successfully added new Transportation Asset Management-related courses to their curriculum. Each course is described below.

- Iowa State University—MTC Director and Adjunct Assistant Professor David Plazak. Several hours of asset management concepts were incorporated into Community and Regional Planning 445/545, “Transportation Policy Planning.” This course was offered for the first time at Iowa State in the Fall of 2001 and attracted a much larger than anticipated enrollment—12 graduate students and 16 upper-level undergraduate students. Student reviews for the course were well above the average for the Department, ensuring that it will be offered every year. The course was offered for a second time in Fall 2002 and drew about 15 students, the number it was originally designed for.
- Lincoln University -- Assistant Professor Sherrie Koechling-Andrae. During the Spring 2001 semester, a new public sector accounting course first was offered as part of the Public Administration Curriculum. The course incorporated information on fund accounting, asset valuation and depreciation, GASB-required statements, and related topics. This course is being taken by coop students who work with the Missouri Department of Transportation in its administrative offices.
- University of Missouri-St .Louis -- Dr. Ray Mundy, Director, Center for Transportation Studies. During the Spring 2001 semester, a Marketing course “Domestic Transportation” was first offered covering issues in transportation. Dr. Mundy included the MTC Spring Seminars topics as the basis for special studies by students.
- University of Northern Iowa—Assistant Professor Tim Strauss. “Transportation Geography”, a new course was offered by the Department of Geography, and was taught for the first time in the Fall 2000 semester. Development of this course was partially funded by a mini-grant from the University of Northern Iowa.

The new transportation geography course at UNI has directly led to important professional contacts and more opportunities for UNI students to participate in the development of transportation planning activities in the Waterloo/Cedar Falls metropolitan area. The UNI students and faculty are involved in the analysis and development of a joint university/city public transportation system similar to CyRide at Iowa State University.

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#### **New Student Recruitment Efforts**

Although the MTC Scholars program has achieved record numbers in terms of involvement this year, the demand for future transportation professionals indicates that additional students are needed. As a result, Iowa State University has recently teamed up with the Iowa Department of Transportation, general

contractors, consultants, Des Moines Area Community College, and three high schools in the Des Moines area to begin a pilot student recruitment effort. There are tracks in this effort for both university-bound students and community college-bound students to make them aware of the opportunities that exist in transportation-related fields such as Civil and Construction Engineering, Community and Regional Planning, and Construction Technology. This program will become operational in Spring 2002.

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## **Outreach and Technology Transfer Activities**

MTC's 2000-2001 activities in outreach and technology transfer have centered around a series of workshops and web sites that are helping transportation agencies in the region cope with the complexities of asset management and related accounting requirements.

### **Helping Guide the Implementation of GASB 34's Infrastructure Asset Requirements in Iowa**

As a result of asset management and GASB 34 workshops held last year, CTRE and the MTC were asked to assist the Iowa County Finance Committee in the development of guidelines for counties to use in complying with GASB 34. Other partners in this effort will include the State Auditor's Office, several county auditors, several county engineers, and the Iowa County Engineers' Service Bureau (ICESB). The ICESB took the lead in putting together a web-based system that allows counties (and potentially cities as well) to comply with GASB 34 reporting requirements in a structured manner. The system provides a great deal of help to the users and also is beneficial in that counties in Iowa will all be using the same depreciation-based approach in complying with GASB 34 reporting requirements. CTRE and the MTC provided input into the design of the system and has offered to assist the ICESB in providing training for users. This system is now in use.

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### **Maintaining a GASB 34 Web Site**

Iowa State University created a small, informational web site on GASB 34 during 2000, primarily aimed at the local governments that must comply with its infrastructure accounting provisions. The web site continues to be maintained and expanded and contains links to useful information plus a number of articles on asset management and GAS 34 prepared at MTC-member universities. It also includes an on-line training needs survey. Content from this web site has already found its way onto the official Government Accounting Standards Board (GASB) Web site and the site is linked to other web sites related to GASB 34 and asset management.

The URL for this web site is:  
<http://www.ctre.iastate.edu/gasb34/index.htm>

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### **Maintaining and Expanding a Transportation Research Expo (TREXPO) Web Site**

The virtual transportation research community web site outlined in the MTC's strategic plan is now operational in pilot form and is being tested by faculty at Iowa State University. This web site allows faculty to enter their areas of expertise and past research efforts. It also allows consumers of research (e.g. at State DOTs) to search for expertise or past research. The goal of the web site is to facilitate better dissemination and sharing of research in Region 7 through the use of on-line database technologies, in

this case Cold Fusion. This web site (which we have given a unique identity and Internet address) may be found at: <http://www.trexpo.org>

The latest addition to the TREXPO web site is an extensive array of transportation research web links designed to help researchers and research users find what they are looking for more easily.

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### **GASB 34 and Asset Management Short Courses for Local Officials**

Lincoln University and University of Missouri-Columbia joined to respond to a request from the Missouri LTAP center and the Missouri Division of the FHWA to develop a one-day short course centered on “getting started” with GASB 34. Following preliminary meetings and discussions, Dr. Sherrie Koechling-Andrae from Lincoln University has taken the lead in developing the program. Dr. Cindy Wilson Orndoff, Charles Nemmers, and Dr. Dana Baker from UM-C have joined her in developing and teaching the course. Five presentations are being planned across Missouri. This will be the first major transportation related event sponsored by Lincoln University as a result of their involvement in the MTC. Funding for the course comes from FHWA, MoDOT, the Missouri LTAP Center, and the MTC.

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### **Research Projects and Research Success Stories**

For the third year of the research effort, projects were selected from Iowa State University faculty through an internal Request for Proposal process that took place in the late winter and early spring of 2002. The RFP was focused toward ISU in order to balance the percentage of funding for the host institution. In the end, three new projects were approved and funded, subject to availability of adequate and eligible matching funds. All of the three new projects selected projects focus generally on asset management and closely related subjects.

Approximately \$560,000 in research projects (including a significant share of matching funds) has been approved during Year Three of the UTC grant. Emphasis has been on funding relatively small number of focused projects. Most of them involve the development of tools and techniques for transportation asset management, which is a particular strength of the MTC member schools and faculty. Another \$400,000 in research (\$200,000 UTC and \$200,000 matching funds) is anticipated to be commissioned in grant Year Four.

So far, during the first three award periods, projects have been funded in three of the four MTC region states and at five different universities. One project was funded at a university that is not a member of the consortium. All eight new and ongoing projects are described in the following table.



**New Projects, Approved and Funded During 2002 (Grant Year Three)**

<b>Project Number</b>	<b>Project Title</b>	<b>Principal Investigator(s)</b>
MTC-2002-01	Iowa DOT Bridge Asset Management Using PONTIS: Data Integration, Performance, and Decision Support Tools	Omar Smadi Iowa State University
MTC-2002-02	Reducing Uncertainty in Estimating Heavy Truck VMT and Intersection Inventories	Shauna Hallmark Iowa State University
MTC-2002-03	Improving the Efficiency of Transportation Projects Using Laser Scanning	Ed Jaselskis Iowa State University

**Ongoing Projects, Approved and Funded During 2001 (Grant Year Two)**

<b>Project Number</b>	<b>Project Title</b>	<b>Principal Investigator(s)</b>
MTC-2001-01	Identification and Development of User Requirements to Support Robust Corridor Investment Models	Kathleen Trauth University of Missouri- Columbia
MTC-2001-02	Application of Advanced Remote Sensing Technology to Asset Management	Shauna Hallmark Iowa State University
MTC-2001-03	Research and Training of Private Transportation Providers for the Efficient and Effective Provision of Transportation Services	Ray Mundy University of Missouri-St. Louis

**Ongoing Projects, Approved and Funded During 2000 (Grant Year One)**

<b>Project Number</b>	<b>Project Title</b>	<b>Principal Investigator(s)</b>
MTC-2000-02	GIS-Based Integrated Rural and Small Urban Transit Asset Management System	Carl Kurt University of Kansas
MTC-2000-03	Decision-Support System for Management of Slope Construction and Repair Activities—An Asset Management Building Block	Erik Loehr University of Missouri-Columbia
MTC-2000-04	Roadway Asset Management System Manual for Local Governments	Anil Misra University of Missouri-Kansas City

### Completed Projects (All Grant Years)

Project Number	Project Title	Principal Investigator(s)
MTC-2000-01	Addressing Integration Issues and Developing a Protocol for Integration of Global Positioning Systems Data With Linear Referenced Data in an Asset Management System	Shauna Hallmark Iowa State University
MTC-2000-05	Artificial Intelligence-Based Optimization of Management of Snow Removal	Mohammed Salim University of Northern Iowa

Two Year One projects have now been completed, as indicated in the above tables. The Hallmark project is one of the only references available explaining how multiple data sources can be successfully integrated using linear referencing systems in geographic information systems (GIS). The Salim project was being published as of the date of this Annual Report. It included the development of a complex set of software tools that will be beta tested this winter by winter maintenance officials in the Waterloo/Cedar Fall metropolitan area of Iowa. The “snowplow project” as it is termed by the Geography Department at Northern Iowa, has become the basis for several Master’s theses at UNI. The other three Year One projects are all nearing completion and should provide excellent asset management information and tools for state DOTs, local governments, and public transportation agencies.

The MTC strongly encourages its principal investigators to present their research results to national audiences. Three of the Year One Projects (Hallmark, Loehr, and Roohanirad) were prominently featured in presentations at both the 2002 Transportation Research Board Annual Meeting and at the last National Transportation Asset Management Workshop in Madison, Wisconsin. The strong showing of the MTC-member schools in publishing and presenting asset management materials has led to close involvement in efforts such as AASHTO’s proposed Asset Management Institute and the National Transportation Asset Management Workshop series.

### Strategic Directions for the Future

The MTC is planning on concentrating its efforts in a few strategic areas during the next several years. These include:

1. Continuing to produce high-quality students for the transportation industry in the region and to offer students in the region the best-possible learning experiences.
2. Continuing to aggressively use technologies such as videoconferencing and the World Wide Web to share educational resources within the regions and to coordinate regional research efforts. Considerable focus will go into providing additional distance learning courses and workshops and on the TREXPO web site.
3. Publishing fourth and fifth round RFPs for focused research on asset management and related topics in the Fall of 2002 and the Fall of 2003.

4. Offering additional regional workshops on asset management and GASB 34 as the market permits. As the MTC-funded research projects are completed, the results will be integrated into the MTC's outreach efforts in the region.
5. Being involved in providing technical assistance to transportation agencies and groups (such as AASHTO and TRB) involved in implementing asset management and the infrastructure provisions of GASB 34.
6. Being involved in proposals for national-level research and outreach on transportation asset management through such organizations as TRB and AASHTO.

### **Funding Sources and Expenditures, Year 3**

The MTC is funded primarily from two sources, the federal University Transportation Center grant and matching funds from member universities and state Departments of Transportation in the four state region. At present, matching funds represent 54 percent of the MTC's total budget. As the MTC matures, other sources of matching funds will become more common. These will include state DOT funds matching research projects and private funds being used for new graduate scholarship programs.

In its first three years of operation, the MTC used the majority—approximately 60 percent—of its funding in support of its educational mission. These funds largely provided graduate assistantships to students at its member institutions. In future years, the percentage of funds going toward education may shrink somewhat as other parts of the MTC's operation (e.g. research and outreach) expand. However, education is the top priority mission of the MTC and may be expected to make up over half of the budget each program year.

Outreach activities grew significantly during the first two years and now make up about 15 percent of the total expenditures. Research spending dropped between years one and two, but this is simply a result of carryover funds from Year One being used to fund new research projects during Year Two. In Years Three and Four, the research program was expanded significantly and larger, higher impact projects were funded.

B. Financial Status

**Semi-Annual & Annual Financial Status Report  
University Transportation Centers Program  
Midwest Transportation Consortium**

Name of Grantee: Iowa State University

Grant Year #3: 10/1/01 - 9/30/02

Reporting Period: 4-01-02 to 09-30-02

Grant No. DTRS99-G-0007

CATEGORIES	APPROVED BUDGET	FEDERAL SHARE	MATCHING SHARE
		COMMITTED TO DATE	COMMITTED TO DATE
Center Director Salary (CTRE only)	\$ 39,826.00	\$ 41,734.68	\$ 7,894.17
Faculty Salaries	\$ 291,451.00	\$ 3,055.08	\$ 10,402.53
Administrative Staff Salaries	\$ 80,229.00	\$ 731.58	\$ 49,023.67
Other Staff Salaries	\$ 65,928.00	\$ 12,121.83	\$ 17,701.93
Student Salaries	\$ 409,168.00	\$ 131,179.11	\$ 179,218.23
Staff Benefits	\$ 136,709.00	\$ 21,128.73	\$ 31,556.47
<b>TOTAL SALARIES and BENEFITS</b>	\$ 1,023,311.00	\$ 209,951.01	\$ 295,796.99
Scholarships	\$ 168,019.00	\$ 3,526.23	\$ 137,034.25
Permanent Equipment	\$ -	\$ -	\$ -
Expendable Property & Supplies	\$ 101,783.00	\$ 13,889.51	\$ 4,068.78
Domestic Travel	\$ 53,649.00	\$ 9,245.54	\$ -
Foreign Travel	\$ -	\$ -	\$ -
Other Direct Costs (Specify)	\$ -	\$ -	\$ -
<b>TOTAL DIRECT COSTS</b>	\$ 323,451.00	\$ 26,661.28	\$ 141,103.03
Facilities & Administrative (Indirect) Costs	\$ 530,276.00	\$ 44,303.43	\$ 259,551.91
<b>TOTAL COSTS</b>	\$ 1,877,038.00	\$ 280,915.73	\$ 696,451.94
Federal Share	\$ 870,200.00	\$ 280,915.73	
Matching Share	\$ 1,006,838.00		\$ 696,451.94
Certification: I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.			
Signature of Authorized Certifying Official		DATE REPORT SUBMITTED;  10/31/2002	
Type or Print Name and Title: Shona Roberts Sponsored Programs Accountant		TELEPHONE: (515) 294-5214	

Financial statements for allocations for Years One through Three have been submitted under separate cover. The statement above only represents Year 3 funding.

## **C. Year 3 Performance Indicators**

*for the*

Midwest Transportation Consortium

Lead Institutions:

Iowa State University  
**Center for Transportation Research and Education**

University of Missouri – Columbia  
**Transportation Infrastructure Center**

November, 2002

**Goal 1 - Education:** *A multidisciplinary program of course work and experiential learning that reinforces the transportation theme of the Center.*

**Performance Indicator 1a.** In the Appendix to your Strategic Plan, you provided a baseline list of undergraduate and graduate courses offered by the institution[s] comprising your Center that you considered to be part of a transportation curriculum. Provide a list of courses that have been added or deleted since your submission of the baseline list.

Courses Added:

- **Introduction to Transportation Engineering** (*Iowa State University*)
- **Urban Transportation Planning and Modeling** (*Iowa State University*)
- **Analytical Photogrammetry and Geographic Information Systems** (*Iowa State University*)
- **Physical and Geometric Geodesy** (*Iowa State University*)
- **Transportation Symposium** (*University of Missouri – Columbia and St. Louis*)
- **Software Applications in Supply Chain Management** (*University of Missouri - St. Louis*)
- **GIS Applications** (*University of Northern Iowa*)
- **Transportation Geography** (*University of Northern Iowa*)
- **Public Sector Accounting** (*Lincoln University*)
- **Infrastructure Management** (*University of Missouri - Columbia*)
- **Contemporary Issues in Transportation** (*University of Northern Iowa*)
- **Transportation Policy Planning** (*Iowa State University*)
- **Domestic Transportation** (*University of Missouri – St. Louis*)
- **Transportation Geography** (*University of Northern Iowa*)

Courses Deleted:

- **Introduction to Railroad Planning and Design** (*Iowa State University*)
- **Introduction to Airport Planning and Design** (*Iowa State University*)
- **Information Technologies for Construction** (*Iowa State University*)
- **Remote Sensing and Digital Photogrammetry** (*Iowa State University*)
- **Advanced Highway Design** (*Iowa State University*)
- **Traffic Engineering** (*Iowa State University*)
- **Transportation Systems Development and Management Laboratory** (*Iowa State University*)
- **Surveying and Advanced Surveying** (*University of Missouri - Columbia*)

**Performance Indicator 1b.** Provide the following information about your Center's transportation education program for the academic year being reported (Yr 3), in comparison with the baseline data (Base) you provided in the Appendix to your Strategic Plan:

Transportation Education	Undergraduate		Graduate		Total	
	Base	Yr 3	Base	Yr 3	Base	Yr 3
1b.1 Number of Courses Offered	43	51	30	28	73	79
1b.2 Number of Academic Departments Offering Them	14	14	9	9	15	15
1b.3 Number of Students* Completing Above Courses	3501	3221	150	215	3651	3436
1b.4 Number of Students* Involved in Transportation Research Projects	46	43	81	86	127	114

*\*Do not track individual students. One student completing three courses or involved in three research projects counts as three students.*

**Goal 2 - Human Resources:** *An increased number of students, faculty and staff who are attracted to and substantively involved in the undergraduate, graduate and professional programs of the Center.*

**Performance Indicator 2a.** In the Appendix to your Strategic Plan, you provided a baseline list of the advanced degrees that you considered transportation-related and which were awarded by the institution[s] comprising your Center. Provide a list of advanced degrees that have been added or deleted since your submission of the baseline list.

- **Supply Chain Management Track added to MBA/MIS Program** (*University of Missouri – St. Louis*)

**Performance Indicator 2b.** Provide the following information about your Center's transportation education program for the academic year being reported (Yr 3), in comparison with the baseline data (Base) you provided in the Appendix to your Strategic Plan:

Advanced Transportation Students	Transportation-Related Degree Programs					
	Masters		Doctorate		Total	
	Base	Yr 3	Base	Yr 3	Base	Yr 3
2b.1 Number of Students* Enrolled	51	51	14	8	65	59
2b.2 Number of Students* Receiving Degrees	22	16	4	1	26	17

*\*Count individual students. One student pursuing or receiving a dual degree counts as one student.*



**Performance Indicator 2c.** For each of the individuals who received advanced transportation degrees from the institutions comprising your Center since the start of the grant, provide the following information concerning their first career move after receiving the advanced degree.

Identifier <sup>1</sup>	Citizenship		Title/Position	Is the Position Transportation -Related?		Organization	Type of Organization	
	U.S <sup>2</sup>	Other		Yes	No		Description	Sector <sup>3</sup>
IS01	X		Staff Engineer	X		Snyder Associates	Consultant	I
IS02	X		Staff Engineer	X		Kittleson Associates	Consultant	I
IS03		X	Staff Engineer	X		Benshoof and Associates	Consultant	I
IS04	X		Staff Engineer	X		Iowa DOT	State DOT	G
IS05	X		Staff Engineer	X		Wisconsin DOT	State DOT	G
IS06		X	Staff Engineer	X		O.R. George and Associates	Consultant	I
IS07	X		Staff Engineer	X		HNTB	Consultant	I
IS08	X		Staff Engineer	X		HR Green	Consultant	I
IS09	X		Staff Engineer	X		Oregon DOT	State DOT	G
IS10	X		Ph.D Studies	X		U.C. Davis	State University	A
IS11	X		Unknown	X		BRW	Consultant	I
IS12	X		Transportation Planner	X		Des Moines Iowa MPO	MPO	G
IS13	X		Transportation Planner	X		LSC, Inc.	Consultants	I
MC01		X	Unknown	X		Unknown (Boston Area)	Consultant	I
MC02		X	Unknown	X		Unknown (Texas)	Consultant	I
MC03	X		Unknown	X		University of Missouri	Trans Engineering	T
MC04		X	Unknown		X	Greek Military	Military	G
IS14		X	Unknown	X		Wisconsin	Info Tech	I
IS15		X	Unknown	X		Colorado	GIS Firm	I
IS16	X		Unknown	X		Iowa	Construction	I
IS17		X	Unknown			Unknown	Unknown	U
IS18		X	Unknown			Unknown	Unknown	U
IS19	X		Unknown	X		Terracon	Consultant	I
IS20	X		Unknown	X		CH2M Hill	Consultant	I
IS21	X		Unknown	X		Burns, McDonald	Consultant	I
IS22		X	Unknown	X		Canada	Unknown	U
MC05		X	Unknown	X		U. of Missouri	Civil Engineering	T
MC06	X		Unknown	X		Corps of Eng.	Design	G
MC07	X		Unknown	X		Corps of Eng	Design/Const	G

MC08		X	Unknown	X		Consultant (St. Louis)	Traffic Engineering	I
MC09		X	Unknown	X		Consultant (Taiwan)	Civil Eng/GIS	I
MC10	X		Unknown	X		Industry	Supply Chain Management	I
NI01	X		Law Student		X	U. of Iowa	Law Program	A
NI02	X		Geographic Res.Scientist		X	U. of Northern Iowa	Research	T

<sup>1</sup> Do not report the graduates' names, student numbers or other information that could identify individuals. Instead use some simple identifier that will prevent double-counting of, e.g., a recipient of a Masters degree who then goes on to get a Ph.D.

<sup>2</sup> Includes graduates who are U.S. citizens or Permanent Residents when they make their first career move.

<sup>3</sup> Sector:

- A - Advanced Degree Program
- G - Government
- I - Industry
- T - Teaching / Academic Research
- U - Unknown

**Performance Indicator 2d.** Using the information you provided as Performance Indicator 2c, break out by sector the total number of individuals who are U.S. citizens (or permanent residents of the United States) and whose first career moves have placed them in transportation-related positions.

Sector	Number
2d.1 Advanced Degree Program (A)	1
2d.2 Government (G)	6
2d.3 Industry (I)	11
2d.4 Teaching/Academic Research (T)	1
2d.5 Unknown (U)	0

**Goal 3 - Diversity:** *Students, faculty and staff who reflect the growing diversity of the U.S. workforce and who are substantively involved in the undergraduate, graduate and professional programs of the Center.*

**Performance Indicator 3.** Provide the following data for the students receiving transportation-related advanced degrees (as shown in Performance Indicator 2b.2) and for all students receiving any advanced degree awarded by the institution[s] comprising your Center.

Diversity of Those Receiving Advanced Degrees	Transportation-Related Advanced Degrees Only		All Advanced Degrees	
	Base	Yr 3	Base	Yr 3
3.1 Non-Hispanic White	16	8	2,067	3199
3.2 Hispanic	0	0	31	68
3.3 African-American	0	0	116	258
3.4 Asian/Pacific Islander	8	1	48	81
3.5 Native American	0	0	8	21
3.6 Other	2	8	753	533
<b>Total</b>	26	17	3,023	4160
3.7 Male	22	13	1,631	1848
3.8 Female	4	4	1,392	2312
<b>Total</b>	26	17	3,023	4160
3.9 U.S. Citizens and Permanent Residents	20	7	2,292	3312
3.10 Non-U.S. Citizens	6	10	731	848
<b>Total</b>	26	17	3,023	4160

**Goal 4 - Research Selection:** *An objective process for selecting and reviewing research that balances multiple objectives of the program.*

**Performance Indicator 4a.** Provide the following information about your Center's transportation research selection process during the academic year being reported (Year 3):

Transportation Research Selection	Yr 3
4a.1 Number of Transportation Research Project Proposals Submitted to Center	4
4a.2 Number of Transportation Research Projects Awarded by Center	3
4a.3 Total Budgeted Costs for Those Projects	\$563,460
4a.4 Number of Individuals Listed as Principal Investigators* in Those Projects Awarded	3

*\*Count individual Principal Investigators (PIs). One PI overseeing several projects is counted as one PI.*

**Performance Indicator 4b.** Provide the number and budgeted costs of all research projects which your Center has funded during the year being reported, broken out according to the primary subject of the research.

<b>Primary Subjects of Center-Funded Research in Year 3 (Report each project only once)</b>	<b>Number of Projects</b>	<b>Budgeted Costs (All Sources)</b>
<b>TRANSPORTATION SYSTEM PERFORMANCE:</b>		
4b.1 Measurement, characterization and modeling of system performance and impacts measurement.		
4b.2 Transportation and logistics system operations and management.		
4b.3 Behavioral sciences and human performance.		
4b.4 Transportation planning, economics, and institutional issues.	1	\$ 119,500
4b.5 R&D resource base.		
<b>PHYSICAL INFRASTRUCTURE:</b>		
4b.6 Construction - Improved design and construction practices, processes, structures, and materials.	1	\$ 23,495
4b.7 Maintenance and operations - Technologies and procedures associated with operational efficiency, safety, security, durability, and renewal and maintenance of all categories of transportation infrastructure.		
4b.8 Intermodal facilities - Design and construction principles and technologies specifically relevant to modal connection points.		
<b>INFORMATION INFRASTRUCTURE:</b>		
4b.9 Traffic management - Technologies and systems to maximize infrastructure capacity and improve safety and efficiency, while minimizing environmental impacts.		
4b.10 Fleet operational management - Technologies that facilitate optimal use of vehicles and other assets.	1	\$ 420,465
4b.11 Intermodal operations - Information technologies that facilitate efficient movement of cargo and people among modes and provide needed information to shippers and travelers.		
<b>VEHICLES:</b>		
4b.12 Design and manufacture - Design of new vehicles; development of design tools and principles; application of new materials and technologies, including the investigation of their impacts on safety and security.		
4b.13 Fuels - Vehicle fuels and energy sources, including production and delivery systems.		
4b.14 Technologies involved in inspection, maintenance, repair, disposal and recycling of vehicles.		
<b>OTHER</b>		
4b.15 (Describe)		
<b>TOTAL CENTER RESEARCH</b>	<b>3</b>	<b>\$ 563,460</b>

**Performance Indicator 4c.** Provide the number and budgeted costs of the research projects which your Center has funded during the year being reported, broken out according to special focus area. Unlike the previous break-out by research subject, this assessment expects some double-counting, as projects may involve more than one goal, issue or mode.

Center-Funded Research Relating to Special Focus Areas in Year 3		Number of Projects	Budgeted Costs (All Sources)
GOALS:			
4c.1	Safety		
4c.2	Mobility		
4c.3	Economic Growth and Trade		
4c.4	Human and Natural Environment		
4c.5	National Security		
ENABLING RESEARCH:			
4c.6	Human Performance and Behavior		
4c.7	Advanced Materials		
4c.8	Computer, Information and Communication	3	\$ 563,460
4c.9	Energy and Environment		
4c.10	Sensing and Measurement	1	\$ 23,495
4c.11	Tools for Modeling and Design	1	\$ 420,465
MODAL ORIENTATION:			
4c.12	Air		
4c.13	Highway	3	\$ 563,460
4c.14	Maritime		
4c.15	Rail		
4c.16	Transit		

**Goal 5 - Research Performance:** *An ongoing program of basic and applied research, the products of which are judged by peers or other experts in the field to advance the body of knowledge in transportation.*

**Performance Indicator 5.** Provide the following information about your Center's transportation research performance during the academic year being reported (Year 3):

Transportation Research Performance		Yr 3
5.1	Number of Peer-Reviewed Transportation Research Reports and Books Published	1 *
5.2	Number of Transportation Research Papers Accepted for Presentation at Academic / Professional Meetings	3 *
5.3	Number of External Awards Received for Transportation Research	3 *

\* *Year 1 MTC Research Awards are just beginning to conclude; reports expected to follow during Year 3.*

**Goal 6 - Technology Transfer:** *Availability of research results to potential users in a form that can be directly implemented, utilized or otherwise applied.*

**Performance Indicator 6.** Provide the following information about your Center's technology transfer and outreach efforts during the academic year being reported (Year 3):

Transportation Technology Transfer and Outreach		Year 3
6.1	Number of Visitors to Transportation Center Website	37,721
6.2	Number of Peer-Reviewed Transportation Research Publications Available on Website	2
6.3	Number of Transportation Outreach Events Conducted for Pre-College Students	3 *
6.4	Number of Pre-College Students Participating in Those Events	88 *
6.5	Number of Transportation Seminars, Symposia, Distance Learning Classes, etc., Conducted for Practicing Professionals	27 *
6.6	Number of Practicing Professionals Participating in Those Events	1002 **
6.7	Number of Transportation Center Newsletters and Other Transportation Periodicals Published	1
6.8	Number of Issues Produced	2
6.9	Total Circulation	2500
6.10	Number of Transportation Technology Products Deployed	0

\* *Includes activities leveraged with host institutions*

\*\* *Includes activities leveraged with host institutions and some attendance estimates*